992,123

PATENT SPECIFICATION

992,123

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Int. Cl.:—F 06 j.

COMPLETE SPECIFICATION

DRAWINGS ATTACHED

Improvements in Packing Members

We, LUXEMBOURGEOISE DE BREVETS & DE PARTICIPATIONS, a body corporate of Luxembourg, of: 2 bis, Boulevard Royal, Luxembourg, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to packing members to be used between the cooperating surfaces of a piston and a cylinder, especially in the case of high pressures (jacks and the like), such packing members being made of resiliently deformable material such as rubber.

According to the invention, there is provided a piston and cylinder device having sealing means acting between the piston and cylinder members to separate a higher pressure space from a lower pressure space the sealing means comprising an annular packing member of resiliently deformable material located in an annular recess in one of the members, wherein the axial section of the packing member is rounded at one end to abut the end wall of the recess on the lower pressure side thereof and is bifurcated at its other end to present two projecting lips on the higher pressure side of the packing member, one of the lips making contact with the bottom wall of the recess while the other lip makes contact only with the other of the said members, the bottom wall of the recess is cylindrical so as not to inter-engage with the packing member and the packing member has at least one annular depression on its side facing the other of the said members.

The invention will be described by way of example with reference to the accompanying drawings, in which:

Figs. 1 to 3 do not illustrate the invention but are given as explanatory views to indicate drawbacks of packing members such as have been made up to now, Figs. 1 and 2 being section views of known packing members and Fig. 3 showing, also in section, the mounting of a packing member as shown by Fig. 2 between a cylinder and a piston,

Fig. 4 shows, in axial section, a first embodiment of a packing member made according to the present invention,

Fig. 5 shows a structure similar to that of Fig. 3 but making use of a packing member such as shown by Fig. 4,

Fig. 6 is a view similar to Fig. 4 showing a modification,

Fig. 7 shows a packing member according to the invention, intended to be mounted on a piston, and

Fig. 8 shows a piston fitted with a packing member such as that of Fig. 7 and mounted in a corresponding cylinder.

The packing members with which the present invention is concerned are to be used in apparatus such as hydraulic jacks or pumps, where the packing member, interposed between a piston and a cylinder, prevents leakage of liquid from a chamber where the pressure is high, for instance several hundreds of kilograms.

The packing members used up to now have several drawbacks.

Apart from "stuffing boxes" the most modern systems generally make use of packing members having U-shaped (or double-lip) cross-section, such as shown by Fig. 1 or 2, Fig. 1 showing a cup-leather packing member 1 and Fig. 2 a packing member made of rubber or similar material and comprising a body 2 of oblong cross-section provided, on the side where a pressure is applied, with two lips 3 and 4.

Such a packing member is mounted between a piston 5 and a cylinder 6, with

some radial tightening both on the inside and on the outside. In the arrangement illustrated by Fig. 3, the packing member is fixed with respect to cylinder 6 and slides with respect to piston 5 and it is housed in a recess 7 of cylinder 6, this recess being closed by a cover 8. The pressure P of the fluid which must be prevented from leaking out between the cylinder and the piston is exerted in recess 7. Under the effect of this pressure, lips 3 and 4 are tightly applied against piston 5 and cylinder 6, respectively, thus ensuring liquidtightness.

There are two serious difficulties to be overcome.

First, narrow packing members of the type of Fig. 1 have a tendency to roll in the direction of arrow F, which may be explained as follows: if the packing member is divided up into elementary annular portions all of the same thickness, the outer elements, having a greater mean diameter, have a greater area than the inner elements, so that the pressure force is greater on the outer elements than on the inner ones. The outer portion of the packing member is therefore subjected to a greater load than the inner portion, and the unbalance thus produced tends to roll member 1 in the direction of arrow F.

In order to obviate this drawback, it is customary to use the arrangement shown in Fig. 3, where a sleeve 9 (provided with holes 10 for the passage of liquid) extends between lips 3 and 4 and bears against the bottom of the groove provided in the packing member. However the efficiency of this arrangement is not wholly reliable.

In the case of very high pressures, it is preferred as a rule to make use of a packing member of the type shown in Fig. 2 and which includes a body 2 of elongated shape, extending between piston and cylinder and which keeps the packing member perfectly in position. But then a second difficulty arises.

The material forming the packing member, whatever be its hardness, is necessarily more or less resilient and it transmits pressure forces so that the packing member is strongly applied over its whole length against the piston and against the cylinder. The length of the portion rubbing against the cylinder becomes considerable, and it is practically impossible to keep a film of lubricant between the packing member and the cylinder. A very great force is then necessary to obtain the desired relative movement. Seizing and heating often cause deterioration.

In accordance with the present invention, in order to eliminate these difficulties, the cross-section of body 2, instead of having a substantially rectangular shape, has, on the side of the working surfaces, at least one recess or depression 11, whereby there remains, during operation, an annular space wherein oil or grease is retained, thus avoiding excessive friction (Figs. 4 and 5).

Furthermore, the working lip 3 should be shorter than lip 4, although this is not absolutely necessary. In any case, the working lip must not touch the member 6 in which it is mounted.

Finally on the side of body 2 opposed to lips 3, 4, the longitudinal section of this body is given a rounded shape, i.e. a part-toroidal shape as shown at 12, which serves to prevent any pinching of the packing member when it is mounted or under the effect of pressure.

Of course the packing member will be suitably dimensioned to obtain a suitable pressure on the working surfaces. Thus, in the mounting of Fig. 5, which relates to a packing member to be mounted fixed in a cylinder 6, so that the working portion of this member is its inner surface in contact with piston 5 (plunger piston of a hydraulic jack, for instance), the cross section of the inner wall of the packing member comprises projecting portions where the diameter is a little smaller than the diameter *d* of the piston (Fig. 4), whereas the outer wall diameter of the packing member is a little smaller than the diameter *d*, of the bearing surface of the cylinder. Thus, it is necessary slightly to expand the packing member to engage it on the piston so that, on the one hand it is slightly tightened on the piston and, on the other hand, it is sufficiently expanded to bring its outer wall into contact with the cylinder.

Fig. 4 shows the shape of the packing member, before it is expanded to mount it.

By way of example, for a packing member of a conventional type to be mounted on a piston of a diameter smaller than 50 mm, the dimensions should advantageously be as follows:

—outer diameter slightly smaller (by a value ranging from 0 to 0.3 mm) than that of the cylindrical housing where the packing member is to be fitted;

—inner diameter of lip 3 smaller than the piston diameter by a value ranging from 1 to 1.5 mm;

—inner diameter of the body toroidal portion 12 smaller than the piston diameter by a value ranging from 0.2 to 0.5 mm.

A joint according to the invention works as follows:

When the high pressure P exists in chamber 7, it acts at the same time in the space 13 between lips 3 and 4 and applies them strongly against piston 5 and cylinder 6, thus achieving liquid-tightness in the conventional manner. The relatively great longitudinal dimension of the packing member and the reaction of the toroidal por-

tion thereof prevent any rolling of said member. The presence of the rounded portions 14 of body 12 and of recess 11, which give the resilient material some freedom of expansion, impart a favourable resiliency to the packing member. The rubber mass is subjected to internal counter-pressures and recess 11 never disappears completely so that, in the central portion of the packing member, contact with the piston is ensured through the intermediate of a permanent reserve of lubricant which considerably reduces friction and prevents seizure or deterioration of the packing member.

What has been said concerning a packing member sliding on the piston and fixed with respect to the cylinder applies in the same manner to a packing member fixed with respect to the piston and sliding against the cylinder wall, as shown in Fig. 8. The shape of the packing member before mounting is shown in Fig. 7.

It should be noted that several recesses such as 11 may be provided, as illustrated in Fig. 6.

WHAT WE CLAIM IS:—

1. A piston and cylinder device having sealing means acting between the piston and cylinder members to separate a higher pressure space from a lower pressure space, the sealing means comprising an annular packing member of resiliently deformable material located in an annular recess in one of the members, wherein the axial section of the packing member is rounded at one end to abut the end wall of the recess on the lower pressure side thereof and is bifurcated at its other end to present two projecting lips on the higher pressure side of the packing member, one of the lips making contact with the bottom wall of the recess while the other lip makes contact only with the other of the said members, the bottom wall of the recess is cylindrical so as not to inter-engage with the packing member and the packing member has at least one annular depression on its side facing the other of the said members.

2. A piston and cylinder device according to Claim 1, wherein the lip in contact with the other of the said members is shorter than the lip in contact with the bottom wall of the recess.

3. A piston and cylinder device substantially as hereinbefore described with reference to any of Figures 4 to 8 of the accompanying drawings.

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Fig.1

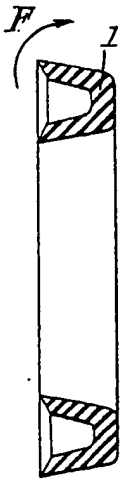


Fig.2

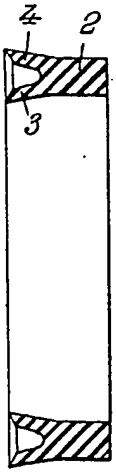


Fig.3.

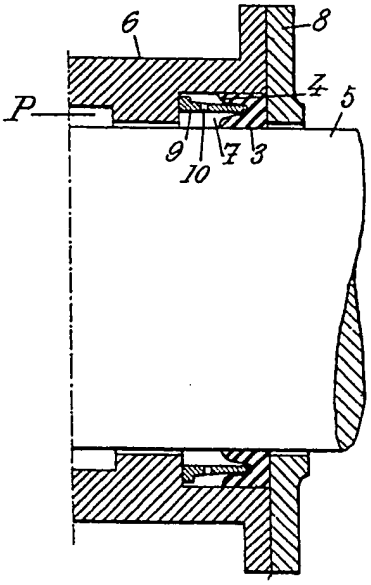


Fig.7

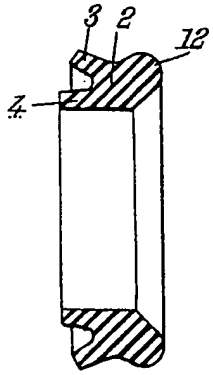
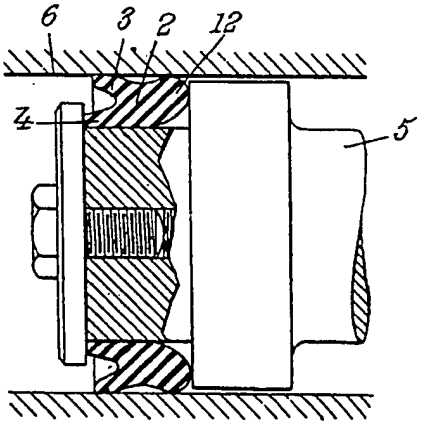


Fig.8



992,123 COMPLETE SPECIFICATION
2 SHEETS
This drawing is a reproduction of the Original on a reduced scale.
SHEETS 1 & 2

Fig.6

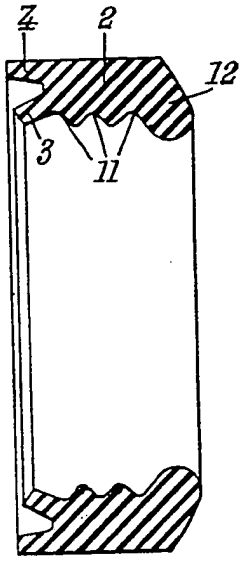


Fig.4

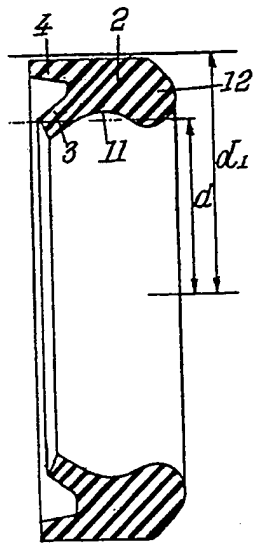
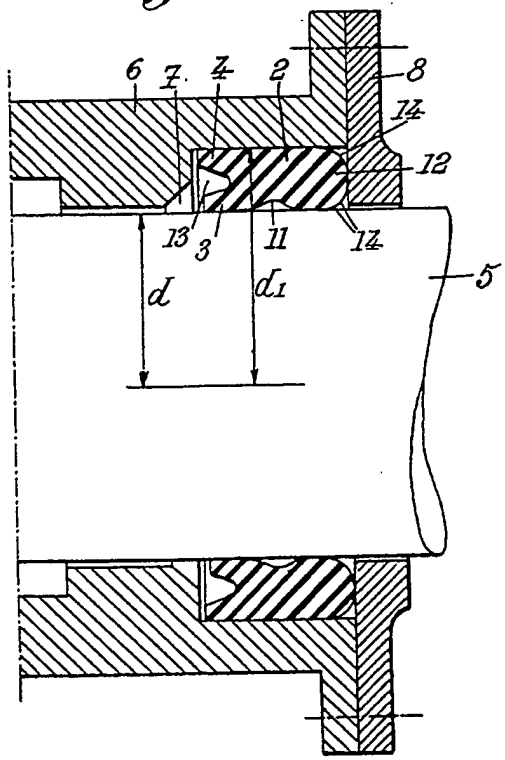


Fig.5



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2 SHEETS

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SHEETS 1 & 2

Fig.1

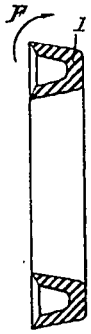

Fig.2

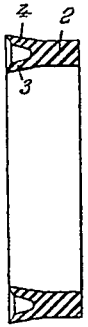

Fig.3.

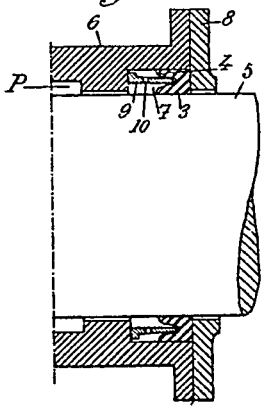

Fig.6

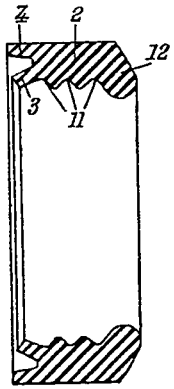

Fig.4

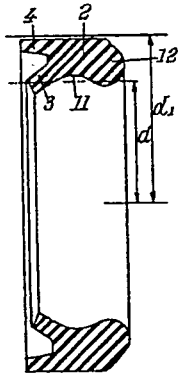

Fig.5

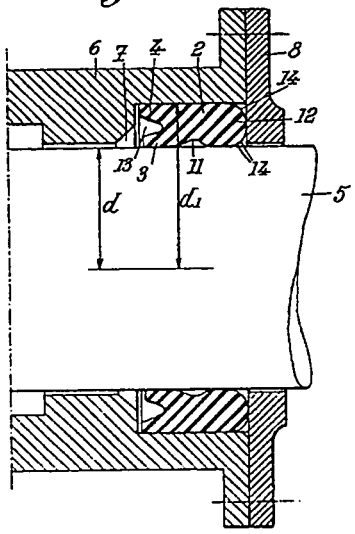

Fig.7

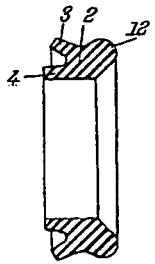

Fig.8